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PERCSPECTIVES ON RESEARCH

THE VICIOUS CIRCLE OF BLACKOUTS AND REVENUE COLLECTION IN DEVELOPING ECONOMIES: EVIDENCE FROM GHANA

Access to reliable electricity is critical for economic growth in developing countries. A reliable power source is needed to form and sustain successful businesses, as well as to implement modern production processes that, in turn, boost the economy. In Sub-Saharan Africa, this situation is improving for rural areas where significant policy efforts are underway to expand access to power. A different challenge exists for customers in urban areas. Many homes and businesses are already connected to the power grid, but because of revenue shortfalls and supply shortages, power is intermittent and unreliable, hampering economic growth.

Using data from customer bills gathered from Ghana in PERC working paper 1809, PERC Professor Steven L. Puller and PERC Graduate Fellow Brittany Street, along with co-authors James Dzansi and Belinda Yebuah-Dwamena, investigate whether revenue shortfalls contribute to a negative feedback loop that results in power supply shortages and a weaker electric utility.

Electric utilities in developing countries like Ghana suffer from two main challenges - revenue shortfalls and load shedding. Revenue shortfalls occur because most utilities do not collect enough revenue to cover operating expenditures. These revenue shortfalls are caused by many factors, including the non-payment or under-payment of customer bills. A utility facing such revenue shortfalls must seek out government funding to operate and maintain the grid, subjecting it to the fiscal limitations of the government. It also limits the utility's ability to expand the grid to serve the higher electricity demands that accompany economic growth.

The other challenge facing these utilities - load shedding - occurs when there is not enough electricity to meet real-time demand. Ghana has historically generated much of its energy supply through hydropower plants, and more recently,

natural gas piped in from neighboring countries, but low rainfall amounts, higher demand, and interrupted gas supplies have created a situation where the utility cannot supply enough electricity to meet current needs. To deal with this issue, Ghana's main utility implements rolling blackouts during peak demand times by rotating which grid sectors receive power and shutting off others, reducing the overall electricity load. Load shedding prevents regular customers and businesses from receiving reliable, consistent electricity and is widely believed to be a major barrier to economic growth.

In this paper, the authors examine whether the non-payment of bills contributes to a revenue shortfall for the utility, and if the utility cannot obtain government funding, the utility may not be able to purchase the amount of power needed to meet demand. This would, in turn, cause the utility to enact load shedding. As customers experience frequent load shedding and unreliable power, they may be less likely or able to pay their utility bills due to eroded trust in the utility or lower household income. This feedback loop would then further weaken the utility through perpetually low revenue

“In Sub-Saharan Africa, business owners report electricity as being the second biggest obstacle facing the firm ahead of other barriers such as corruption, crime, workforce education, and political stability.”

collection and act as a major barrier to achieving the goal of providing reliable power to meet growing demand.

Feedback loops are traditionally problematic to study because of two reasons: the variables involved happen simultaneously, making it difficult to isolate a cause, and that it is also difficult to measure the magnitude of the loop itself. The authors address these issues through an institutional feature of the power grid design itself: residential customers are connected to the power grid by individual distribution feeder lines that weave throughout an urban area.

Load shedding is enforced across all feeder lines on a rotating basis, with one exception: specific feeders that are categorized as 'priority' are exempt. These priority feeders serve critical pieces of infrastructure, such as hospitals, military facilities, or government ministries that need reliable power to operate. Because of this, residential customers who are served by priority feeders are not subject to as many rolling blackouts as residents who are not supplied by a priority feeder.

The authors use this variability in reliable power supply, along with household level data on monthly utility payments, to test whether customers who suffer from more blackouts accrue unpaid bills at higher rates than nearby households who are supplied by a priority feeder and suffer less power outages. Detailed spatial data is used to determine

the duration of blackout events on individual feeders for both priority and non-priority lines. This information is then analyzed along with bill payment patterns of individual households.

Results show that customers who face somewhat-random exposure to blackouts and those on non-priority feeders have reduced bill payment in the future. This finding supports the existence of a negative feedback loop. The households that experienced more outages were shown to accrue more unpaid utility bills than those who did not. Fifteen months after the studied time period, those unpaid balances increased to 4.3% of an average household's billed charges. These unpaid charges contribute to the revenue shortfalls faced by utilities.

This revenue trap, where inconsistent power reliability lowers the rate of bill repayment, which in turn causes revenue shortfalls, describes the feedback loop. These shortfalls impede the ability of a utility to procure enough power to meet demand, causing load shedding. Revenue shortfalls affecting the utility also hamper attempts to make upgrades to the grid, which would improve reliability and bill repayment rates. Despite these challenges, this paper and other new research has highlighted the importance of reliable electricity in developing markets. Policy makers are now more informed as to the importance of both grid reliability and increasing bill repayment rates.

MONETARY POLICY UNCERTAINTY: A TALE OF TWO TAILS

One of the major advances in the field of monetary economics in the last few decades has been understanding the role of expectations in the conduct of monetary policy. Expectations about the future, in general, are useful for economic agents, such as households and firms, as they make spending and investment decisions. Policymakers, on the other hand, can directly affect these expectations, creating yet another channel on how policies could be implemented.

As the central banks across the world recognize the valuable role of expectations, there has been a push to set explicit macroeconomic targets and an increased emphasis on communicating their actions consistent with those targets. For example, in the

US, the Federal Reserve Bank strives to promote maximum employment, stable prices and moderate long-term interest rates. Further, since 1994 it started releasing a statement describing policy actions after the Federal Open Market Committee meetings. Prior to the financial crisis of 2008, these actions were related to decisions to move the Federal funds rate. In the aftermath of the financial crisis and the recession that followed afterwards, with the Federal funds rate close to zero, the Federal Reserve moved to unconventional tools, typically implemented in a form of large-scale asset purchases or forward guidance – an explicit communication from the Federal Reserve about the likely future course of monetary policy, both with the intention of lowering

“Clearer communication in tightening could be linked to better anchored expectations about the path of monetary policy”

the long-term interest rates directly.

The literature has quantified the effects of monetary policy on the macroeconomy, yet the research focusing on the effects of the uncertainty associated with monetary policy is limited. There is also a large body of emerging literature on the effects of macroeconomic (as opposed to monetary policy) uncertainty, which finds uncertainty to be recessionary in general. A main factor that is unique to monetary policy uncertainty is that a central bank has direct control over it, making it more relevant to changes in policy.

In PERC working paper 1808, PERC Fellow Tatevik Sekhposyan and coauthor Tatjana Dahlhaus study the link between monetary policy uncertainty and interest rate predictability as well as the effects of the uncertainty on the larger economy. The authors adhere to the notion that monetary policy is more uncertain when it is less predictable. They use both survey-based and market-based forecasts of the Federal funds rate to measure the predictability in interest rates.

The proposed measure of uncertainty in the paper is the likelihood of the observed outcome based on historical information: the lower the probability, the higher the uncertainty. The authors find that the survey participants and the markets both typically underestimate interest rate movements. However, the degree of the underestimation depends on the monetary environment. For instance, as the interest rates are rising, i.e., in a tightening monetary environment, agents, on average, make smaller mistakes, than when the interest rates are decreasing. Moreover, the mistakes in a monetary tightening environment are higher probability events, relative to the ones made in an environment of monetary easing. Consequently, there is less monetary uncertainty in tightening relative to easing.

Furthermore, the uncertainty in tightening

episodes have decreased over time, while it has stayed constant over time for easing periods. The authors associate this differential behavior of uncertainty with the intensity of the communication coming from the Federal Reserve.

Central banks, however, typically respond to macroeconomic information. For instance, interest rates could rise in response to, everything else equal, higher levels of expected inflation. How much of the monetary policy uncertainty is associated with the uncertainty about macroeconomic outcomes? The authors address this issue by constructing uncertainty measures about output growth and inflation, using the same survey and methodology. Results show that uncertainty regarding both macroeconomic variables are not associated with the monetary policy environment by itself. More formal regression-based analysis indeed confirms this result: after purging of macroeconomic uncertainty, there still appears to be a close association between monetary policy uncertainty and the monetary policy environment. This provides further evidence arguing for a separate role of monetary policy uncertainty.

Lastly, the paper looks at the propagation of monetary policy uncertainty by dissecting the sample into two: one associated with monetary tightening regime, where the interest rates are increasing, and another one with monetary easing regime, where interest rates are decreasing. The paper finds differences in the propagation of the monetary policy uncertainty in these two regimes. Though uncertainty appears to be recessionary in both regimes, the decline of output in response to an increase in uncertainty is stronger in easing than in tightening. After controlling for macroeconomic uncertainty, the effects of monetary policy uncertainty in general dampen. Although the uncertainty about macroeconomic fundamentals seems to be relevant for macroeconomic transmission, it is not the main driver of monetary policy uncertainty.

This analysis mainly focuses on the Federal funds rate expectations, which characterize the uncertainty associated with conventional monetary policy. It also provides some additional evidence on how uncertainty evolves over time in the unconventional monetary policy period by looking at the longer-term interest rate expectations. However, given the small sample size associated with that period, the results at this point are merely suggestive and require further analysis.



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